MITSUBISHI ELECTRIC

LCD Projector

FL7000U

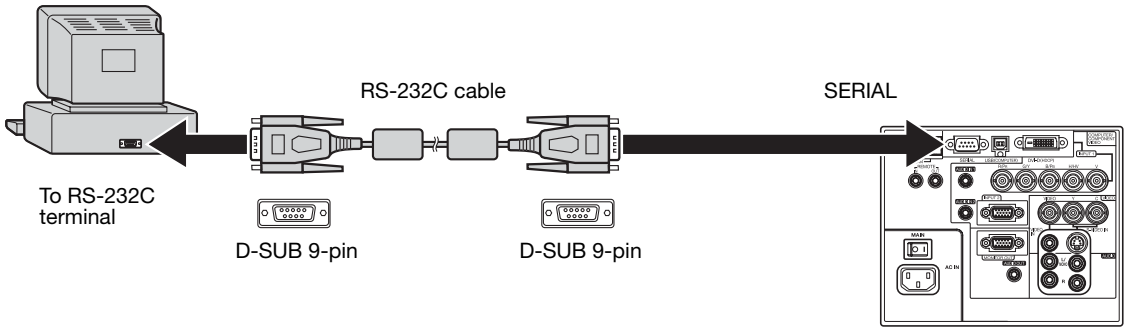
Controlling the projector using a personal computer

This projector can be controlled by connecting a personal computer with RS-232C terminal.

PC-controllable functions:

- Turning the power ON or OFF
- Changing input signals
- Inputting commands by pressing the buttons on the control panel and remote control
- Menu setting

Connection



Important:

- Connect the computer with the projector on a one-to-one basis.
- Make sure that your computer and projector are turned off before connection.
- Boot up the computer first, and then plug the power cord of the projector.
  (If you do not follow this instruction, the Com port may not function.)
- Adapters may be necessary depending on the PC connected to this projector. Contact your dealer for details.

1. Interface

1.1 Pin assignment of SERIAL terminal (D-SUB 9-pin)

Pin No.	Name	I/O
1	OPEN	
2	RXD	IN
3	TXD	OUT
4	OPEN	
5	GND	
6	OPEN	
7	OPEN	
8	OPEN	
9	OPEN	

1.2 Communications format

PROTOCOL	RS-232C
BAUD RATE	9600 [bps]
DATA LENGTH	8 [bits]
PARITY BIT	NONE
STOP BIT	1 [bit]
FLOW CONTROL	NONE

This projector uses RXD, TXD and GND lines for RS-232C control.
For RS-232C cable, the reverse type cable should be used.

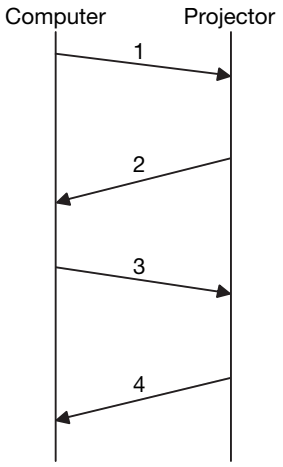
2. Control command diagram

The command consists of the address code, function code, data code, and end code. The length of the command varies among the functions.

	Address code	Function code	Data code	End code
ASCII	'30h' 30h'	Function	Data	'0Dh'
Character	00	Function	Data	↵

[Address code] 00 (In ASCII code, '30h' '30h') fixed.
[Function code] A code of each fixed control move.
[Data code] A code of each fixed control data (number) and not always indicated.
[End code] ↵ (In ASCII code, '0Dh') fixed.

3. Control sequence



	Sequence	Note
1	Send the command from the personal computer to the projector.	
2	The projector will send a return command after it receives an end code.	If the projector does not receive commands normally, that is, if the projector is not connected physically or unable to receive commands, it does not send out a return command. The projector sends out a return command within one second at the latest.
3	The personal computer checks the command and confirms if the sent command has been received or not.	Although the projector receives the commands, it in some cases does not execute the commands.
4	Use the check command to see if the projector has executed the command.	This projector sends various codes other than the return code. When having a control sequence by RS-232C, reject other codes from the personal computer.

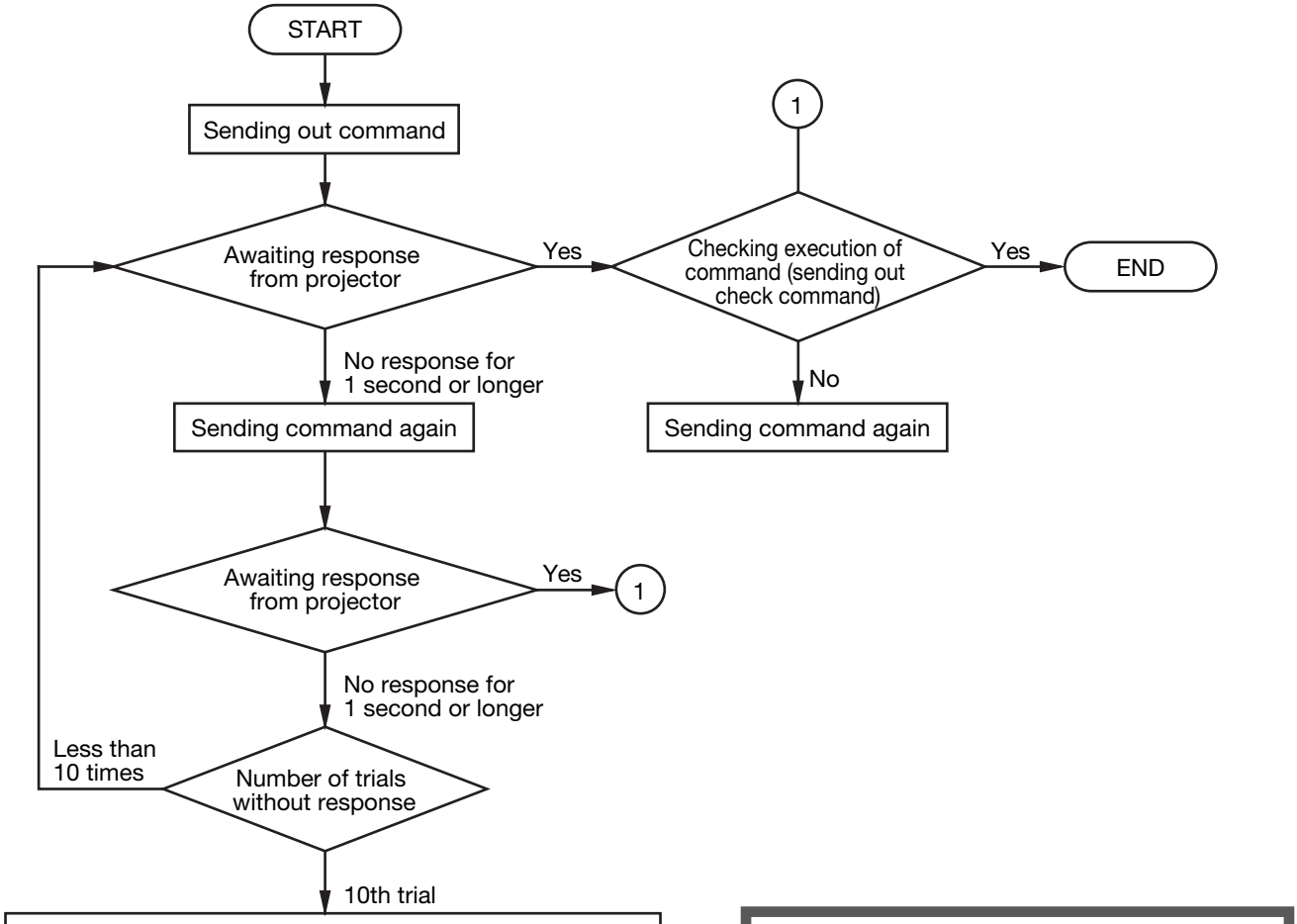
- Although the projector sends out the return command, the command may not take effect in the following cases.
  (1) During signal switching
  (2) In the process of the auto position
  (3) After the power is turned on.
  The projector receives no commands for about 20 seconds (or for 2 minutes at the longest if the lamp does not light up promptly as the life is expiring.)
- When sending commands successively, wait to receive the return command of the current command before sending a next command.
- The projector may not receive a command when the splash screen is being displayed immediately after turning on the power. Use command "00r10" to cancel the splash screen.
- While using the LAN terminals, the LAN functions take precedence.
- For the LAN terminals, the same commands as those for connecting with the TCP/IP (port number 63007) are available. Note, however, that the response becomes slightly slower than when using the RS-232C terminals.

[Example] When turning the power ON. (Figures and symbols enclosed in quotation marks are ASCII codes.):

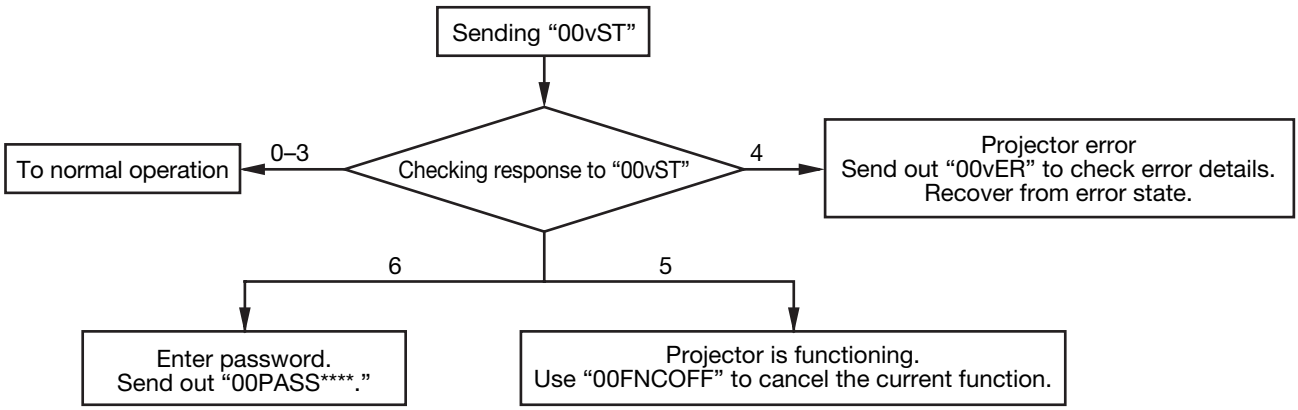
Sending commands from the PC, etc.	Status code from the projector	Description
'30' '30' '21' '0D' 00!↵		Command for POWER ON
	'30' '30' '21' '0D' 00!↵	Command receipt confirmation (Command echo back)

- The flowchart on the next page shows the recommended operating sequence for your reference to create a program.

[RS-232C control flowchart]


START
Sending out command
Awaiting response from projector
Yes
Checking execution of command (sending out check command)
Yes
END
1
No response for 1 second or longer
Sending command again
No
Sending command again
Awaiting response from projector
Yes
1
No response for 1 second or longer
Less than 10 times
Number of trials without response
10th trial
Check the following.
• The projector is not supplied with AC power.
→ Check that AC power cord is connected.
→ Turn on the power. (Turn on the circuit breaker or main switch.)
• Not connected with the projector.
→ Check that the RS-232C cable is connected.
→ Check the RS-232C cable for electrical discontinuity.
• The projector is in the state of being unable to send out a command.
→ Use command "00vST" to check if the projector operates normally.
Note: In the following conditions, the projector does not respond even if it operates normally.
• Immediately after turning on the power (for about 20 seconds to 2 minutes)
• During switching signals (about 10 seconds)
• In the process of the auto position (about 10 seconds)
• During locking the password

[Method of checking state of projector]



4. Command list

4.1 Operation commands (Not executable in stand-by mode. When the commands for input select are sent while the splash screen is being displayed, the splash screen is only canceled.)

The operation commands are used for the basic operation setting of this projector. They may not be executed while the signals are changed. The operation commands have no data codes.

ITEM	Function		Note
	Character	ASCII	
POWER ON	!	21h	This command is invalid for 1 minute after the power is turned off.
POWER OFF	"	22h	This command is invalid for 1 minute after the power is turned on.
INPUT COMPUTER 1	_r1	5Fh 72h 31h	This command will not be executed in Stand-by mode or when the MUTE is executed.
INPUT COMPUTER 2	_r2	5Fh 72h 32h	This command will not be executed in Stand-by mode or when the MUTE is executed.
INPUT DVI	_d1	5Fh 64h 31h	This command will not be executed in Stand-by mode or when the MUTE is executed.
INPUT VIDEO	_v1	5Fh 76h 31h	This command will not be executed in Stand-by mode or when the MUTE is executed.
INPUT S-VIDEO	_v2	5Fh 76h 32h	This command will not be executed in Stand-by mode or when the MUTE is executed.

[Example] When setting the input signal to COMPUTER 1. (Figures and symbols enclosed in quotation marks are ASCII codes.):

Sending commands from the PC, etc.	Status code from the projector	Description
'30' '30' '5F' '72' '31' '0D' 00_r1↵		Command for setting the input signal to COMPUTER 1
	'30' '30' '5F' '72' '31' '0D' 00_r1↵	Command receipt confirmation (Command echo back)

4.2 Reading command diagram

The projectors operating status, such as POWER-ON/OFF and the currently selected input terminal, etc. can be monitored.

ITEM	Character		ASCII	
	Function	Data (Receive)	Function	Data (Receive)
POWER ON	vP	1	76h 50h	31h
POWER OFF	vP	0	76h 50h	30h
INPUT COMPUTER 1	vI	r1	76h 49h	72h 31h
INPUT COMPUTER 2	vI	r2	76h 49h	72h 32h
INPUT DVI	vI	d1	76h 49h	64h 31h
INPUT VIDEO	vI	v1	76h 49h	76h 31h
INPUT S-VIDEO	vI	v2	76h 49h	76h 32h
POWER ON/OFF IMPOSSIBLE	vPK	0	76h 50h 4Bh	30h
POWER ON/OFF POSSIBLE	vPK	1	76h 50h 4Bh	31h
NO SIGNAL SUPPLIED	vSM	0	76h 53h 4Dh	30h
SIGNAL SUPPLIED	vSM	1	76h 53h 4Dh	31h

Use the following commands to obtain the values of the items in the INFORMATION menu.

ITEM	Function		Data (Receive)
	Character	ASCII	
LAMP TIME (LOW)	vLE	76h 4Ch 45h	hhhhmm
RESOLUTION	vRESO	76h 52h 45h 53h 4Fh	HHHHxVVVV
VERTICAL FREQUENCY	vVFREQ	76h 56h 46h 52h 45h 51h	***.**
HORIZONTAL FREQUENCY	vHFREQ	76h 48h 46h 52h 45h 51h	***.**
SYNC. TYPE	vSYNCT	76h 53h 59h 4Eh 43h 54h	0 (NO SIGNAL), 3 (3wire), 4 (4wire), 5 (5wire), 6 (SCART)

"hhhh" and "mm" represent hours and minutes respectively.
"HHHH" and "VVVV" represent the horizontal and vertical resolutions respectively.

Use the following commands to obtain other information.

ITEM	Function		Data (Receive)
	Character	ASCII	
Model name	vMDL	76h 4Dh 44h 4Ch	**********(within 16 characters)
Serial number	vS/N	76h 53h 2Fh 4Eh	*******(within 7 characters)
Input source	vSOUCE	76h 53h 4Fh 55h 43h 45h	r1 r2 d1 v1 v2

ITEM	Function		Data (Receive)
	Character	ASCII	
Projector status	vST	76h 53h 54h	0 (Stand-by mode), 1 (Within 1 minute after POWER-ON (warm-up mode)), 2 (POWER-ON mode (including state of warning)), 3 (Cooling mode), 4 (Abnormal state (including shutdown due to an error)), 5 (State of functioning (menu display, dialog display, MUTE, SPLIT, FREEZE)), 6 (Awaiting password entry)
Error status	vER	76h 45h 52h	Reading out error data (3 digits, hexadecimal numbers, total 9 bits) (MSB) xb1, xb2... xb8, xb9, 0, 0, 0 (LSB) xb1: Fan error xb2: Lamp error (The lamp goes out or does not light.) xb3: Lamp warning 1 (The lamp life has expired.) xb4: Lamp warning 2 (The lamp life is expiring.) xb5: Temperature error xb6: The temperature warning is being indicated. xb7: Lamp cover open error xb8: Filter cover open error xb9: States of other component abnormality

The PC sends the command without attaching the data code to it. On the other hand, the projector attaches to the received command its current operating status as the data code and send it back to the PC.

[Example] When checking the currently selected input terminal (when the INPUT VIDEO is being selected). (Figures and symbols enclosed in quotation marks are ASCII codes.):

Sending commands from the PC, etc.	Status code from the projector	Description
'30' '30' '76' '49' '0D' 00vl↵		Command for checking the input terminal
	'30' '30' '76' '49' '76' '31' '0D' 00vlv1↵	Check result (VIDEO)

4.3 Remote commands (Not executable in stand-by mode. When the remote commands are sent while the splash screen is being displayed, the splash screen is only canceled.)

Some remote control operations can be achieved by the remote command codes. The remote commands have no data codes.

Button's name on remote	Function	
	Character	ASCII
+/VOLUME	r06	72h 30h 36h
-/VOLUME	r07	72h 30h 37h
ZOOM/FOCUS	r0f	72h 30h 66h
LENS SHIFT	r47	72h 34h 37h
KEYSTONE	r43	72h 34h 33h
SPLIT	r04	72h 30h 34h
AV MUTE	ra6	72h 61h 36h
▲	r53	72h 35h 33h
▼	r2b	72h 32h 62h
◀	r4f	72h 34h 66h
▶	r59	72h 35h 39h
MENU	r54	72h 35h 34h
ENTER	r10	72h 31h 30h
AUTO POSITION	r09	72h 30h 39h
FREEZE	ra4	72h 61h 34h
ASPECT	re2	72h 65h 32h
CE	re7	72h 65h 37h

[Example] When displaying the MENU selection bar. (Figures and symbols enclosed in quotation marks are ASCII codes.):

Sending commands from the PC, etc.	Status code from the projector	Description
'30' '30' '72' '35' '34' '0D' 00r54↵		Command operating the same as the MENU button
	'30' '30' '72' '35' '34' '0D' 00r54↵	Command receipt confirmation (Command echo back)

4.4 Direct commands (Not executable in stand-by mode. Possible only to read during muting.)

The direct commands are used for the keystone setting of this projector with the value.

ITEM	Function		Data
	Character	ASCII	
VOLUME	VL	56h 4Ch	00–31
KEYSTONE (vertical)	KS	4Bh 53h	±15

How to set the value

Use the character or ASCII code as shown below to set the value.

Character	+	-	0	1	2	3	4	5	6	7	8	9
ASCII	'2Bh'	'2Dh'	'30h'	'31h'	'32h'	'33h'	'34h'	'35h'	'36h'	'37h'	'38h'	'39h'

[Example] When setting the volume to 15. (Figures and symbols enclosed in quotation marks are ASCII codes.):

Sending commands from the PC, etc.	Status code from the projector	Description
'30' '30' '56' '4C' '31' '35' '0D' 00VL15↵		Command for setting the volume
	'30' '30' '56' '4C' '31' '35' '0D' 00VL15↵	Command receipt confirmation (Command echo back)

4.5 Function commands (Not executable in stand-by mode. When the mute commands are sent while the splash screen is being displayed, the splash screen is not muted but only canceled.)

The mute commands are used for the mute setting of this projector with the 0 (30h) and 1 (31h).

ITEM	Function		Data
	Character	ASCII	
AV MUTE	MUTE	4Dh 55h 54h 45h	0 (OFF), 1 (ON)
SPLIT	SPLT	53h 50h 4Ch 54h	0 (OFF), 1 (ON)
FREEZE	FRZ	46h 52h 5Ah	0 (OFF), 1 (ON)
Function canceling	FNCOFF	46h 4Eh 43h 4Fh 46h 46h	

4.6 Menu setting commands (Not executable in stand-by mode. Possible only to read during muting.)

The menu setting commands are used for the menu setting of this projector. If the personal computer sends the command without attaching the data code, the projector attaches to the received command its current setting value as the data code and send it back to the PC.

ITEM	Function		Data
	Character	ASCII	
COLOR ENHANCER	CE	43h 45h	0 (AUTO), 1 (PRESENTATION), 2 (STANDARD), 3 (THEATER), 4 (sRGB), 5 (USER)
COLOR ENHANCER-USER-GAMMA MODE	CEU1GS	43h 45h 55h 31h 47h 53h	0 (DYNAMIC), 1 (NATURAL), 2 (DETAIL)
COLOR ENHANCER-USER-RGB-COLOR	CEU1C	43h 45h 55h 31h 43h	±10
COLOR ENHANCER-USER-RGB-TINT	CEU1T	43h 45h 55h 31h 54h	±10
CONTRAST	PP	50h 50h	±30
BRIGHTNESS	QQ	51h 51h	±30
COLOR TEMP.	A	41h	1 (STANDARD), 2 (HIGH), 3 (LOW), 4 (USER)
COLOR TEMP.-USER (CONTRAST)	P	50h	±30 ±30 ±30 (R, G, B)
COLOR TEMP.-USER (BRIGHTNESS)	Q	51h	±30 ±30 ±30 (R, G, B)
COLOR	T	54h	±10
TINT	S	53h	±10
SHARPNESS	R	52h	±5
NOISE REDUCTION	NR	4Eh 52h	0 (OFF), 1 (ON)
CTI	CTI	43h 54h 49h	0 (OFF), 1 (ON)
INPUT LEVEL	IPL	49h 50h 4Ch	±5, For DVI input: +0 (NORMAL), +1 (ENHANCED)
LAMP MODE	LM	4Ch 4Dh	0 (STANDARD), 1 (LOW)
AUTO POWER ON	APON	41h 50h 4Fh 4Eh	0 (OFF), 1 (ON)
AUTO POWER OFF	APOF	41h 50h 4Fh 46h	00 (OFF), 05, 10, 15, 30, 60
SPLASH SCREEN	SS	53h 53h	0 (OFF), 1 (ON)

ITEM	Function		Data
	Character	ASCII	
BACK COLOR	BB	42h 42h	0 (BLACK), 1 (BLUE), 2 (IMAGE)
MUTE MODE	MM	4Dh 4Dh	0 (BLACK), 1 (IMAGE)
IMAGE REVERSE	IR	49h 52h	0 (OFF), 1 (MIRROR), 2 (INVERT), 3 (MIRROR INVERT)
ZOOM/FOCUS LOCK	FZL	46h 5Ah 4Ch	0 (OFF), 1 (ON)
LENS SHIFT LOCK	LSL	4Ch 53h 4Ch	0 (OFF), 1 (ON)
LENS SHIFT RESET	LSRST	4Ch 53h 52h 53h 54h	
ASPECT	SC	53h 43h	0 (AUTO), 1 (16:9 (FULL)), 2 (REAL)
PASSWORD FUNCTION	PSLOCK	50h 53h 4Ch 4Fh 43h 4Bh	0**** (UNLOCK), 1**** (DISPLAY INPUT), 2**** (MENU ACCESS), 3**** (SPLASH ID SCREEN) **** is a 4 to 8-digit password comprised of any figures 1 to 4.
MENU POSITION	MP	4Dh 50h	0 (Upper left), 1 (Lower right)
CINEMA MODE	CINE	43h 49h 4Eh 45h	0 (VIDEO), 1 (AUTO), 2 (FILM)
VIDEO SIGNAL (VIDEO only)	VS	56h 53h	0 (AUTO), 1 (NTSC), 2 (PAL), 3 (SECAM), 4 (4.43NTSC), 5 (PAL-M), 6 (PAL-N), 7 (PAL-60)
SET UP	STU	53h 54h 55h	0 (AUTO), 1 (OFF), 2 (3.75%), 3 (7.5%)
SCART INPUT	SRT	53h 52h 54h	0 (OFF), 1 (ON)
LANGUAGE	LG	4Ch 47h	00 (日本語), 01 (English), 02 (Español), 03 (Deutsch), 04 (Français), 05 (Italiano), 06 (中文), 07 (한국어), 08 (РУССКИЙ), 09 (PORTUGUÊS), 11 (SVENSKA), 12 (POLSKI)
RESET ALL	RSTALL	52h 53h 54h 41h 4Ch 4Ch	
MEMORY CALL	MMC	4Dh 4Dh 43h	0 (AUTO), 1 (MEMORY1), 2 (MEMORY2)
HORIZ.POSITION	HP	48h 50h	+ (increment), - (decrement)*1
VERT. POSITION	VP	56h 50h	+ (increment), - (decrement)*1
FINE SYNC.	FN	46h 4Eh	00–31
TRACKING	TRK	54h 52h 4Bh	+ (increment), - (decrement)*1
COMPUTER INPUT	CIN	43h 49h 4Eh	0 (RGB), 1 (YC_BC_R/YP_BP_R), 2 (AUTO)
OVER SCAN	VOS	56h 4Fh 53h	00 (90%) – 10 (100%)
HOLD	HLD	48h 4Ch 44h	0 (OFF), 1 (ON)
HOLD BEGIN	HLB	48h 4Ch 42h	00–99
HOLD END	HLE	48h 4Ch 45h	00–99
CLAMP POSITION	CLP	43h 4Ch 50h	001–255
CLAMP WIDTH	CLW	43h 4Ch 57h	01–63
VERT. SYNC	VSC	56h 53h 43h	0 (AUTO), 1 (OFF)
LPF	LPF	4Ch 50h 46h	0 (OFF), 1 (ON)
SHUTTER(U)	SHU	53h 48h 55h	00–20
SHUTTER(L)	SHL	53h 48h 4Ch	00–20
SHUTTER(LS)	SHLS	53h 48h 4Ch 53h	00–20
SHUTTER(RS)	SHRS	53h 48h 52h 53h	00–20

*1) Setting range differs depending on the input signals.

- Some commands are not executed depending on the input signal. The operational restrictions same as those on the menu setting are applied. Refer to “Menu operation” in the User Manual for more details.

How to set the value

Use the character or ASCII code as shown below to set the value.

Character	+	-	0	1	2	3	4	5	6	7	8	9
ASCII	‘2Bh’	‘2Dh’	‘30h’	‘31h’	‘32h’	‘33h’	‘34h’	‘35h’	‘36h’	‘37h’	‘38h’	‘39h’

[Example 1] When setting the AUTO POWER ON to ON. (Figures and symbols enclosed in quotation marks are ASCII codes.):

Sending commands from the PC, etc.	Status code from the projector	Description
‘30’ ‘30’ ‘41’ ‘50’ ‘4F’ ‘4E’ ‘31’ ‘0D’ 00APON1↵		Command for setting the AUTO POWER ON to ON
	‘30’ ‘30’ ‘41’ ‘50’ ‘4F’ ‘4E’ ‘31’ ‘0D’ 00APON1↵	Command receipt confirmation (Command echo back)

[Example 2] When setting the CONTRAST R of the COLOR TEMP.-USER to +10, the CONTRAST G to 0, and the CONTRAST B to -5. (Figures and symbols enclosed in quotation marks are ASCII codes.):

Sending commands from the PC, etc.	Status code from the projector	Description
'30' '30' '50' '2B' '31' '30' '2B' '30' '30' '2D' '30' '35' '0D' 00P+10+00-05↵		Command for setting the picture control
	'30' '30' '50' '2B' '31' '30' '2B' '30' '30' '2D' '30' '35' '0D' 00P+10+00-05↵	Command receipt confirmation (Command echo back)

[Example 3] When checking the TINT setting (when the TINT is set to +10). (Figures and symbols enclosed in quotation marks are ASCII codes.):

Sending commands from the PC, etc.	Status code from the projector	Description
'30' '30' '53' '0D' 00S↵		Command for checking the TINT setting
	'30' '30' '53' '2B' '31' '30' '0D' 00S+10↵	Check result (+10)

[Example 4] When setting the GAMMA MODE of the COLOR ENHANCER-USER to DETAIL. (Figures and symbols enclosed in quotation marks are ASCII codes.):

Sending commands from the PC, etc.	Status code from the projector	Description
'30' '30' '43' '45' '55' '31' '47' '53' '32' '0D' 00CEU1GS2↵		Command for setting the picture control
	'30' '30' '43' '45' '55' '31' '47' '53' '32' '0D' 00CEU1GS2↵	Command receipt confirmation (Command echo back)

4.7 Password lock commands

The password lock commands control the password lock. The password lock enabling or disabling command is sent with a 4 to 8-digit password comprised of any figures 1 to 4 added to the end of the data code. When the password lock is enabled or disabled successfully, the projector sends a return command comprising the data code, password, and "1" at the end. When enabling or disabling the password lock fails, it sends a return command with "0" at the end. There is no reconfirmation of the password. The password input command is for enabling projection of image when password lock has been set to DISPLAY INPUT. The password input command is sent with a 4 to 8-digit password comprised of any figures 1 to 4 at the end.

ITEM	Function		Data
	Character	ASCII	
Password lock enabling/ disabling	PSLOCK	50h 53h 4Ch 4Fh 43h 4Bh	0**** (Disabling), 1**** (DISPLAY INPUT), 2**** (MENU ACCESS), 3**** (SPLASH ID SCREEN)
Password input	PASS	50h 41h 53h 53h	****

**** is a 4 to 8-digit password comprised of any figures 1 to 4.

[Example] When enabling the password lock of DISPLAY INPUT (in the case that the password is 123412):

Sending commands from the PC, etc.	Status code from the projector	Description
'30' '30' '50' '53' '4C' '4F' '43' '4B' '31' '31' '32' '33' '34' '31' '32' '0D' 00PSLOCK1123412↵		Command for enabling the password lock of DISPLAY INPUT
	'30' '30' '50' '53' '4C' '4F' '43' '4B' '31' '31' '32' '33' '34' '31' '32' '31' '0D' 00PSLOCK11234121↵	Response informing that the projector succeeded in enabling the password lock of DISPLAY INPUT